Center Independent Research & Development: GSFC IRAD

Parametric Amplifiers for Microwave Kinectic Inductance Detector (MKID) Readout

Completed Technology Project (2011 - 2012)

Project Introduction

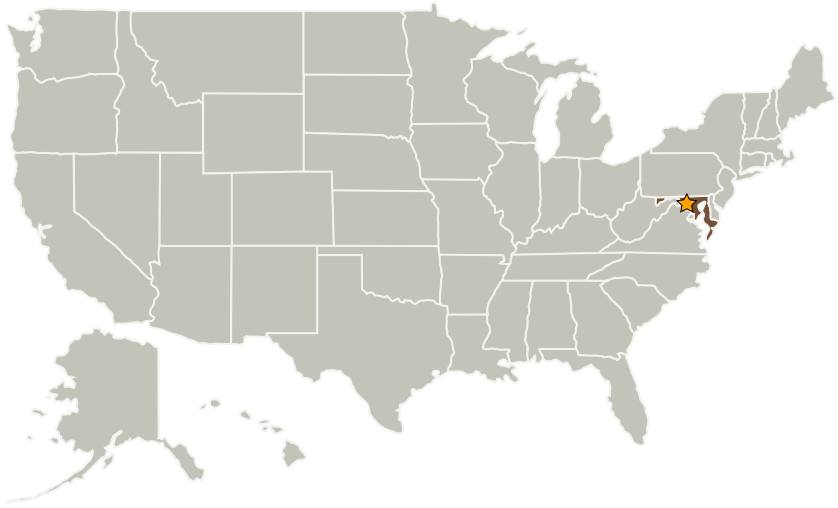
Build a microwave amplifier with near quantum-limited sensitivity, octave or greater bandwidth, gain > 20 dB for input signals in the frequency range 1 – 10 GHz, and power dissipation negligible compared to typical cooling powers at its operating temperature. To obtain broad bandwidth, we will make traveling wave amplifiers using a non-linear material. To avoid shock formation, we will make periodic structures with stop bands to block shock-forming harmonics.

Find numerical solutions to the non-linear partial differential equations describing our amplifier transmission lines. Optimize periodic choke structure to block shock formation while maximizing parametric gain. Measure the microwave properties of our transmission lines at cryogenic temperatures.

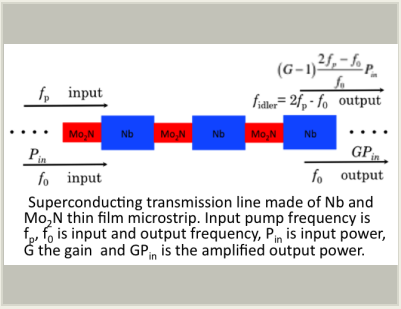
Anticipated Benefits

N/A

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland



Superconducting transmission line made of Nb and Mo_2N thin film microstrip. Input pump frequency is f_p, f_0 is input and output frequency, P_{in} is input power, G the gain and GP_{in} is the amplified output power.

Project Image Parametric Amplifiers for Microwave Kinectic Induced Demonstration (MKID) Readout

Table of Contents

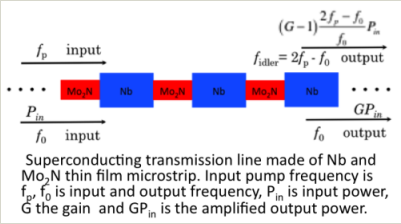
Parametric Amplifiers for Microwave Kinectic Inductance Detector (MKID) Readout

Completed Technology Project (2011 - 2012)

Primary U.S. Work Locations

Maryland

Images



Superconducting transmission line made of Nb and Mo_2N thin film microstrip. Input pump frequency is f_p, f_0 is input and output frequency, P_{in} is input power, G the gain and GP_{in} is the amplified output power.

5134.png
Project Image Parametric Amplifiers for Microwave Kinectic Induced Demonstration (MKID) Readout *(https://techport.nasa.gov/image/1290)*

Project Website:

http://aetd.gsfc.nasa.gov/

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Center Independent Research & Development: GSFC IRAD

Project Management

Program Manager:

Peter M Hughes

Project Manager:

Terry Doiron

Principal Investigator:

Thomas R Stevenson

Co-Investigators:

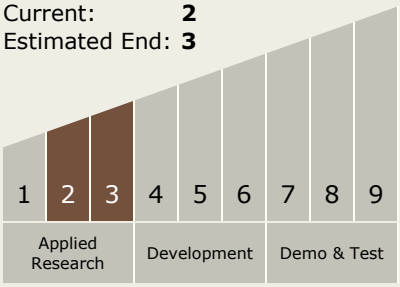
Edward J Wollack
Negar Ehsan
Samuel H Moseley
John E Sadleir

Parametric Amplifiers for Microwave Kinectic Inductance Detector (MKID) Readout

Completed Technology Project (2011 - 2012)

Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **3**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes